

Title: Multiple-fold Umbrella as Quickly Opened and Closed

Background of the Invention:

A conventional multiple-fold umbrella comprises a rib assembly having an umbrella cloth secured thereon, and including at least a top rib, an intermediate rib and a rear rib pivotally connected with one another and pivotally secured to a central shaft. However, when opening or closing the conventional umbrella, the rear rib should be further pulled or folded by the user's hand in order to help open or close the umbrella cloth, thereby causing inconvenience for the user.

It is lacking for a mechanism for automatically ejecting the rear rib of the rib assembly outwardly when opening the umbrella; or for automatically retracting the rear rib inwardly when closing the umbrella.

The present inventor has found these drawbacks and invented the present multiple-fold umbrella as quickly opened or closed.

Summary of the Invention:

The object of the present invention is to provide a multiple-fold umbrella including a rib assembly pivotally secured to a central shaft, with the rib assembly including a stretcher rib pivotally connected with a top rib and pivotally secured to the central shaft, an intermediate pivotally connected between the stretcher rib and a rear rib, and a resilient connecting rib slidably coupled with the

intermediate rib and resiliently secured between the stretcher rib through a spring device and the rear rib, whereby upon opening of the umbrella, the resilient connecting rib will be arcuately bent in order for automatically ejecting the rear rib outwardly for quickly opening the umbrella without being pulled by the user's hand; and upon closing of the umbrella, the spring device, which is previously tensioned to store its resilience when opening the umbrella, will restore the rib assembly to resiliently retract the rib assembly for accelerating the folding of the umbrella.

#### Brief Description of the Drawings:

Fig. 1 is an illustration showing a folded umbrella of the present invention.

Fig. 2 is a cross sectional drawing of the present invention as viewed from 2-2 direction of Fig. 1.

Fig. 3 is a cross sectional drawing as viewed from 3-3 direction of Fig. 1.

Fig. 4 is a cross sectional drawing as viewed from 4-4 direction of Fig. 1.

Fig. 5 is a partially enlarged view of the spring device of the present invention.

Fig. 6 shows the present invention when approximating the fully opening state.

Fig. 7 is an enlarged view from Fig. 6, showing the relationship

of the inner portion of the resilient connecting rib with the other ribs of the present invention.

Fig. 8 shows the relationship of the outer portion of the resilient connecting rib with the other ribs of the present invention, as enlarged from Fig. 6.

Fig. 9 shows the umbrella of the present invention when fully opened, following Fig. 6.

Fig. 10 shows the relationship of the inner portion of the resilient connecting rib with the other ribs, as enlarged from Fig. 9.

Fig. 11 shows the relationship of the outer portion of the resilient connecting rib with the other ribs, as enlarged from Fig. 9.

Fig. 12 shows another preferred embodiment of the present invention when opened.

#### Detailed Description:

As shown in Figs. 1~11, the present invention comprises: a central shaft 1, and a multiple-fold rib assembly 2 pivotally secured to the central shaft 1 and having an umbrella cloth C secured on the rib assembly 2.

The rib assembly 2 includes: a top rib 21 pivotally secured to an upper notch 20 formed on a top of the central shaft 1, a stretcher rib 22 pivotally secured to a runner 20r slidably held on the shaft 1, an intermediate rib 23 having its innermost end 231 pivotally secured to the top rib 21 through an inner connecting rib 25 and having an

inner rib portion 232 (adjacent to the innermost end 231) of the intermediate rib 23 pivotally secured to an outer end of the stretcher rib 22, a resilient connecting rib 24 slidably coupled to the intermediate rib 23, and a rear rib 26 respectively pivotally secured to an outer end 233 of the intermediate rib 23 and to an outer end 242 of the resilient connecting rib 24 through a joint 27.

The present invention as illustrated is a triple-fold umbrella, but the number of folds are not limited in this invention.

The stretcher rib 22 includes: a wide groove 22w formed in an upper (or inner) portion of the rib 22, and a narrow groove portion 22n in a lower (or outer) portion of the rib to be communicated with the wide groove 22w.

A spring device 3 is slidably held in the stretcher rib 22, and includes: a spring 31 having its inner spring end 311 secured to the inner end portion of the stretcher rib 22 or secured to the runner 20r, and a rod 32 secured to an outer spring end 312 of the spring 31.

The spring 31 is slidably held in the wide groove 22w and the rod 32 (or the major portion of the rod 32) is slidably held in the narrow groove 22n.

The rod 32 has its inner rod end 321 connected with the outer spring end 312 of the spring 31, having a free outer rod end 322 approximating an outer end of the stretcher rib 22 and approximating the inner rib portion 232 of the intermediate rib 23, and a hook portion 323 protruding outwardly from an outer rod portion of the

rod 32 through a slot 22s notched in a bottom of the stretcher rib 22 to be connected with an inner end 241 of the resilient connecting rib 24.

The intermediate rib 23 may be made of plastic material (including reinforced plastics or composites) such as injection molding process, having an inner retainer 23a and an outer retainer 23b disposed on an inner portion (adjacent the inner rib portion 232) and an outer portion (adjacent the outer end 233) of the intermediate rib 23 for limiting the resilient connecting rib 24 within the main groove 23i formed in a bottom (or inner) portion of the intermediate rib 23 for slidably coupling the resilient connecting rib 24 with the intermediate rib 23.

The intermediate rib 23 has its main groove 23i formed in the bottom or inner portion of the rib 23 adapted to be engaged with the stretcher rib 22 (especially the narrow groove portion 22n) when folding the umbrella; and having a shallow groove 23t recessed in an outer portion of the rib 23 adapted to be engaged with the rear rib 26 when closing the umbrella.

The joint 27 as secured to an inner end 261 of the rear rib 26 includes: a pivotal portion 272 pivotally connected with a bifurcated outer end 233 of the intermediate rib 23 by a first pivot 272p; and a biasing portion 271 pivotally connected with an outer end 242 of the resilient connecting rib 24 by a second pivot 271p.

The joint 27 may be formed by integral forming process to be a

P-shape structure. The joint 27 has a flat edge portion 270 to be retained by a retainer plate 23p formed on an upper portion of the intermediate rib 23 when opening the umbrella as shown in Fig. 11; and having a shallow recess 270r formed in the flat edge portion 270 for receiving the outer end 242 of the resilient connecting rib 24 when closing the umbrella as shown in Fig. 1.

As shown in Figs. 9, 11, the resilient connecting rib 24 is not a straightly linear structure, defining an axial line  $L_1$ , which is unaligned with a linking line  $L_2$  by linearly linking the first pivot 272p and the second pivot 271p, so that upon folding of the rib assembly when closing the umbrella, the outer end 242 of the resilient connecting rib 24 will thrust the biasing portion 271 of the joint 27 counter-clockwise for retracting the rear rib 26 and other ribs for closing the umbrella from Figs. 9, 11, through Figs. 6, 8, and finally to Fig. 1. Otherwise, if lines  $L_1$  and  $L_2$  are linearly aligned, the ribs will not be biased, folded and closed.

When opening the umbrella of the present invention from Fig. 1 to Figs. 6, 9, the runner 20r is raised to extend the ribs of the rib assembly 2 (especially to extend the parallelogram link set consisting of ribs 21, 22, 23 and 25) to be a generally linear configuration as shown in Fig. 6. At this time, the resilient connecting rib 24 has its inner end 241 secured to the spring device 3 and also resiliently cushioned by the spring device 3 held in the stretcher rib 22 to obtain a resilient cushioning for smoothening the

operation for opening the umbrella and for preventing from noise as possibly occurring among the ribs; and having the resilient connecting rib 24 been arcuately bent (Fig. 6~8) to store its resilience, of which the outer end 242 of the resilient connecting rib 24 is simultaneously arcuately bent (Fig. 8) to get its spring energy.

Gradually, the spring energy especially existing at the outer end 242 of the connecting rib 24 will restore to automatically quickly bias the joint 27 and the rear rib 26 to be linearly positioned as shown in Figs. 9~11 (especially from Fig. 6 to Fig. 9) to fully open the umbrella. The umbrella cloth C as secured on the rear rib 26 will be simultaneously extended outwardly for automatically opening the umbrella. Therefore, there is no need to manually pull (by the user's hand) the umbrella cloth (especially on the rear rib 26) outwardly for fully opening the umbrella, thereby being superior to the conventional multiple-fold umbrella.

When the runner 20r is raised to the uppermost position to fully open the umbrella, the spring 31 of the spring device 3 is tensioned to store its resilience. Upon closing of the umbrella, the resilience of the spring 31 will help retract the ribs of the rib assembly for quickly closing the umbrella. The closing operation sequence is a "reverse procedure" by reversing the steps for opening the umbrella (i.e., from Fig. 9 through Fig. 6 to Fig. 1).

The inner retainer 23a and the outer retainer 23b as disposed on opposite end portions of the intermediate rib 23, besides their

function for limiting the resilient connecting rib 24 within the groove of the intermediate rib 23, will serve as reinforcing members for enhancing the strength of the intermediate rib 23.

When folding the rib assembly 2 when closing the umbrella (Fig. 1), the top rib 21 and the inner connecting rib 25 will be received into (and engaged with) the wide groove 22w of the stretcher rib 22, while the narrow groove portion 22n will be received into (and engaged with) the main groove 23i of the intermediate rib 23 for minimizing the folding volume. Therefore, the ribs may be stably engaged with one another when closing the umbrella as guided by the above-mentioned engagements of the corresponding ribs, like a "ball-and-socket" mechanism; and the ribs may thus be smoothly extended as initially guided by such engagements (ribs 21, 25 in groove 22w; and rib 22 in rib 23) without being twisted or deformed, being helpful for opening the umbrella quickly.

Accordingly, the present invention can be operated for opening or closing the umbrella quickly, smoothly and conveniently.

As shown in Fig. 12, another preferred embodiment of the present invention is disclosed by modifying the spring device 3 as aforementioned.

The spring device 3 as slidably held in a groove 220 in the stretcher includes: a spring 31a having its inner spring end 311a orienting inwardly towards the runner 20r and secured in the stretcher rib 22, and an outer spring end 312a secured to a slide



member 32a, with the slide member 32a slidably held in the groove 220 in the stretcher rib 22 and having a hook portion 323a protruding outwardly through a slot 22s notched in the stretcher rib 22 to be connected with an inner end 241 of the resilient connecting rib 24. The aforementioned rod 32 of the spring device 3 has now been modified to be the slide member 32a slidably held in the stretcher rib 22.

Besides the quick opening function of the present invention, the spring device 3 when opening the umbrella will store its spring energy, which will help restore to quickly fold the umbrella, namely performing a reverse operation by reverting the umbrella-opening procedure to be the umbrella-folding steps. The umbrella cloth C will be simultaneously folded, without the aid of the user's hand, to be a compact folded umbrella.

The present invention may be modified without departing from the spirit and scope of the present invention.